DIPLOMA EXAMINATIONS

CURRICULUM SPECIFICATIONS

for

CHEMISTRY 30

JULY 1983
Revised

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Alberta Education acknowledges with appreciation the contributions of the following members of the committee involved in the development of the curriculum specifications for Chemistry 30.

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Introduction

The Chemistry 30 curriculum specifications were originally prepared in July 1981 by a committee of classroom teachers, consultants, university personnel, and Alberta Education staff under the direction of the Curriculum Branch. The specifications are based on the 1978 program of studies and were validated by practicing chemistry teachers throughout the province in the fall, 1981.

Purpose of Curriculum Specificatons

Curriculum specifications identify the specific course content and the relative emphases to be placed thereon for the purposes of instruction and evaluation. Evaluation at both the provincial level and the school level should be guided by these specifications. For these purposes, the Chemistry 30 specifications indicate the per cent weightings to be placed on the components of the program (i.e., process skills, psychomotor skills, attitudes, and concepts) and priority assigned to subject matter. The specifications do not necessarily reflect the amount of instructional time to be devoted to each component, but should serve as a guide in presenting the course. The reader is advised to consult the curriculum guide for this purpose or for further information regarding course objectives, program organization, and suggested methodology.

Weighting Factors

Two measures have been utilized to specify the relative weighting to be placed on course content.

1. Per Cent Emphasis

   Table 1 indicates the per cent emphasis to be placed on each of the components of the course and the subject matter.

2. Priority Rating

   While all the content of the Chemistry 30 course is deemed important, some concepts and skills have greater importance than others and this should be reflected in the instruction given to students. The priority rating serves to highlight these differences for instruction and evaluation purposes.

CODE: A - high priority
B - medium priority
C - low priority

Objective statements which have low priority status should not be passed over quickly or ignored. Each objective statement contributes to the overall program and is necessary to the student's full understanding of the subject. Provincial testing will include items from all three priority levels.

TABLE 1
CHEMISTRY 30

PROGRAM COMPONENT	EMPHASIS IN PER CENT
PROCESS SKILLS	20
PSYCHOMOTOR SKILLS	10
ATTITUDES	10
CONCEPTS	60

DIPLOMA EXAMINATION

The Grade 12 Diploma Examination for Chemistry 30 will include items related to chemical energetics, acids and bases, and oxidation-reduction.

The scientific process skills of predicting, hypothesizing, controlling variables, classifying, interpreting data, observing, inferring, designing experiments, and defining operationally are dealt with to the extent pencil-and-paper testing permits. The experiences gained by direct, hands-on activities are, understandably, difficult to measure outside a laboratory situation and should be reflected in student performance as evaluated by the teacher.

Subject matter in the attitudinal and psychomotor components of the program are excluded in the diploma examination.

A bulletin outlining the per cent emphases to be placed on Chemistry 30 content in the diploma examination will be forwarded to all schools by the Student Evaluation Branch.

NOTE: Certain concepts in chemistry are approached differently in the various prescribed references. The following areas of concern have been noted, and the Student Evaluation Branch will use the guidelines below.

Chemical Energetics: Heat of reaction (ΔH) can be calculated from heats of formation or by the addition of equations that include heat terms. Both methods of calculating ΔH may be tested.

Acids and Bases: The concepts of K_A and % reaction can serve the same function in many acid-base calculations. Since both values are given for the acids in the Chemistry Data Booklet, the student may use either method in answering acid-base questions.

Oxidation-Reduction: Oxidation numbers and half-reactions can each serve to balance redox equations. Both concepts may be tested.

PROGRAM COMPONENTS

A. PROCESS SKILLS 20%

PRIORITY RATING		EMPHASIS IN PER CENT
A	Identifying problems	20
A	Controlling variables	
A	Seeking background information	
A	Predicting	
A	Hypothesizing	
A	Designing methods for data collection	
C	Observing	
C	Measuring	
B	Processing Data	
B	Classifying	
B	Graphing mathematical analysis	
A	Interpreting data	

PROGRAM COMPONENTS Cont.

PRIORITY RATING		EMPHASIS IN PER CENT
A	Inferring	Cont.
A	Defining operationally	
A	Formulating models	
B	Seeking further evidence	
B	Applying discovered knowledge	

B.	**PSYCHOMOTOR SKILLS**	**10%**
Equal Emphasis	Develop and calibrate tools and instruments	10
	Develop and manipulate various tools, instruments, apparatus, and materials proficiently	
	Carry out various accepted procedures and techniques, for example, laboratory work, field work, and preparations	
	Develop and follow safe practices and procedures	

C.	**ATTITUDES**	**10%**
Equal Emphasis	Awareness	10
	Be aware of the chemical factors related to issues of current interest.	
	Appreciation	
	Develop an appreciation of chemistry as it contributes to meeting individual vocational and intellectual needs.	

D.	CONCEPTS (SUBJECT MATTER)	60%

PRIORITY RATING			EMPHASIS IN PER CENT
B	Each substance has a definite and characteristic heat content or enthalpy	1. The enthalpy of a substance is the sum of the kinetic and potential energies of the molecules.	4
A		2. The heat of formation is the energy required or released as a substance is formed from its elements.	
B	Change in matter involves a change in energy	1. Changes that require energy are endothermic and those that release energy are exothermic.	16
B		2. More energy is involved in a nuclear change than in a chemical change, and in general more energy is involved in a chemical change than in a phase change.	
A		3. In a phase, chemical, or nuclear change, the change in energy is the energy of the products less the energy of the reactants.	
A		4. The ΔH of chemical and phase changes is determined calorimetrically.	
B		5. By addition of ΔH values for known reactions, ΔH values for new reactions can be predicted.	
A		6. The amount of energy released or absorbed in a phase, chemical, or nuclear change is related to the number of moles of reactants.	

PRIORITY RATING			EMPHASIS IN PER CENT
B	Acids and bases can be defined in different ways	1. Acids taste sour, change the color of indicators, etc. Bases taste bitter, change the color of indicators, etc.	7
B		2. Acids neutralize bases.	
B		3. Arrhenius defined acids as those substances that increase the $H_3O^+(aq)$ concentration and bases as those that increase the OH-(aq) concentration.	
A		4. Brønsted and Lowry defined acids as proton donors and bases as proton acceptors.	
A	The relative acidity of a solution can be measured	1. The strengths of acids and bases vary and are a measure of the equilibrium condition.	5
A		2. The pH scale is a measure of the $H_3O^+(aq)$ concentration.	
B		3. Indicator color may be used to determine the pH.	
A	Acid-base reactions involve an exchange of protons	1. An acid-base reaction can be represented by a net ionic equation.	8
A		2. The relative strengths of bases can be used to predict the equilibrium conditions.	
A		3. Titration is one of the main techniques used in quantitative measurement of acid-base reaction.	
A		4. The determination of quantitative relationships in acid-base reactions is part of stoichiometry.	
B	Redox reactions involve an exchange of electrons	1. Oxidation is defined as the loss of electrons. Reduction is defined as the gain of electrons.	4
A		2. Oxidizing agents cause oxidation and reducing agents cause reduction to occur.	
A		3. A redox reaction can be represented by a net ionic equation.	
B	In a redox reaction the electron loss and gain must balance	1. Oxidation numbers of half-reactions illustrate the loss and gain of electrons.	
A		2. Oxidation numbers of half-reactions may be used to balance equations.	

PRIORITY RATING			EMPHASIS IN PER CENT
B		3. Titration is one of the main techniques in quantitative measurement of redox reactions.	6
A		4. The determination of quantitative relationships in redox reactions is part of stoichiometry.	
B	The electric potential of a redox reaction can be predicted and measured	1. Reduction potentials are relative potentials of reduction half-reaction.	6
C		2. Oxidation potentials are negative reduction potentials.	
A		3. The relative strengths of oxidizing and reducing agents are compared in terms of a table of reduction potentials.	
A		4. The net potential of a redox reaction is the sum of the oxidation and reduction potentials.	
A		5. The spontaneity of a redox reaction can be predicted from the relative strengths of the oxidizing agents or from the positive sign of the net potentials.	
A	Redox reactions involve electrical energy	1. Electrochemical cells convert chemical energy to electrical energy.	4
A		2. Electrolytic cells are used to convert electrical energy to chemical energy.	
B		3. There are many applications of electrochemical and electrolytic cells.	

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